BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(12) UK Patent Application (19) GB (11) 2 279 763 (13) A

(43) Date of A Publication 11.01.1995

(21) Application No 9311518.6

(22) Date of Filing 03.06.1993

(71) Applicant(s)
Verreries Hirtz SA

(Incorporated in France)

Sarrewerden (Bas-Rhin), 67260 Sarre-Union, France

(72) Inventor(s)
Laurent Aumercier

(74) Agent and/or Address for Service
Hyde, Heide & O'Donnell
10-12 Priests Bridge, LONDON, SW15 5JE,
United Kingdom

(51) INT CL[6]
A47G 1/00 , G02B 5/08

(52) UK CL (Edition N)
G2J JMX
A4V V26

(56) Documents Cited
GB 0350329 A GB 0274842 A US 4192905 A

(58) Field of Search
UK CL (Edition L) A4V V26 , G2J JMX
INT CL[5] A45D , A47G , G02B
WPI

(54) Decorative bevel-edged mirror

(57) The mirror 10 comprises a sheet 12 of glass, the rear face 14 of which carries a coating 16 of silver, the mirror having a bevelled edge zone 20 formed on the rear face 14 of the glass sheet and carrying a chromium coating 18. The chromium coating 18 has a visible reflectivity less than that of the silver coating. The bevelled edge zone has an area in the plane of the glass sheet occupying about 31% of the glass sheet. The mirror is formed by silvering the rear face, the bevelled edge zone is then formed and finally the chromium coating is formed on the bevelled edge zone by cathodic vacuum deposition. The coated bevelled zone may alternatively be on the front of the mirror.

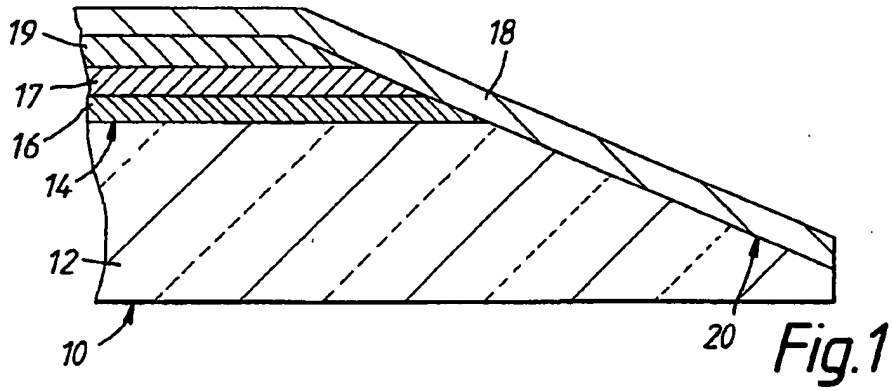

Fig.1

GB 2 279 763 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

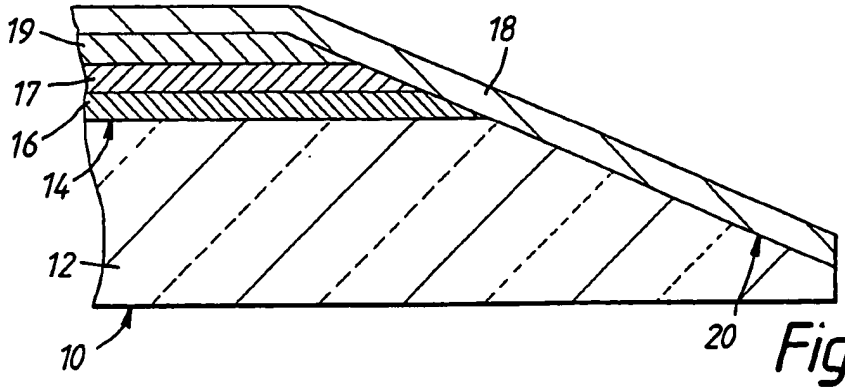

Fig.1

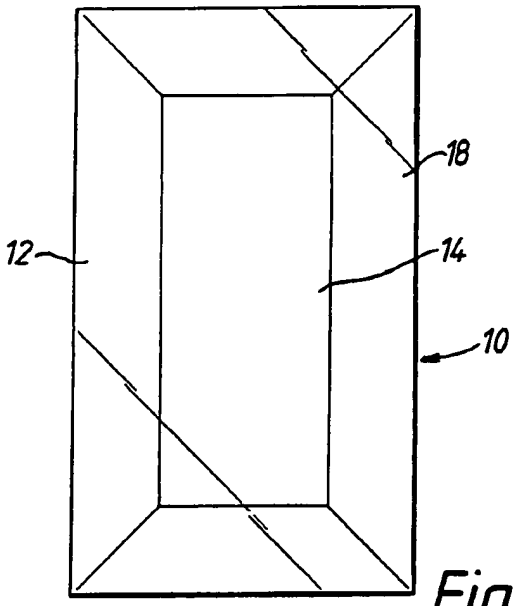

Fig.2

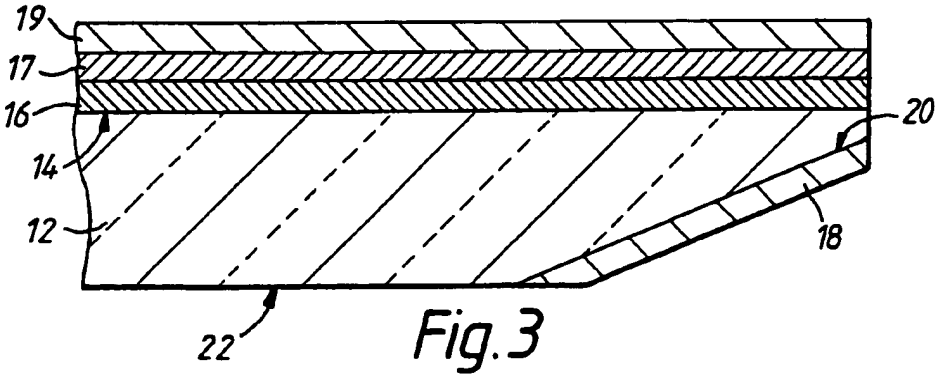

Fig.3

A DECORATIVE MIRROR AND A METHOD FOR FORMING THE SAME

The present invention relates to a decorative mirror and to a method for forming such a mirror.

Decorative mirrors are known, especially for use in bathrooms and for incorporation in furniture, where the mirror comprises a sheet of transparent material, the rear face of which carries a coating of a reflective material, the mirror having a bevelled edge zone formed on the front face. The most reliable method for obtaining such a bevelled mirror by a process of classical silvering is to bevel that face of the glass which does not carry the coating, that is to say the front face.

It is an objective of the present invention to provide a decorative mirror which provides further decorative effects and to provide a suitable process for forming such a mirror.

According to a first aspect of the invention, there is provided a decorative mirror comprising a sheet of transparent material, one face of which carries a coating of a reflective material, the mirror having a bevelled edge zone, characterised in that the inclined face of the bevelled edge zone carries a coating of a reflective material. By the provision of a reflective material coating on the inclined face of the bevelled edge zone, particular aesthetic effects can be achieved, due to the fact that reflection from the mirror is not uniform, there being a plurality of planes of reflection. Other advantages of the decorative mirrors according to the invention will become apparent from the following description.

Although it is possible for the reflective material carried on said one face to be the same as the reflective material carried on the inclined face of the bevelled edge zone, in preferred embodiments of the invention, said one face carries a coating

of a first reflective material and the inclined face of the bevelled edge zone carries a coating of a second, different, reflective material.

We prefer that said one face is the rear face of the sheet. Thus the mirror usually comprises a central zone, carrying a coating of the first reflective material, such as silver, on the rear face thereof and an outer edge zone which is bevelled and carries a coating of a different reflective material. The reflection from the mirror as a whole is therefore not uniform, but incorporates a sharp transition, for example, from a central zone of high reflectivity to an outer edge zone of lower reflectivity, thereby generating desirable aesthetic effects. The mirrors according to the invention have the appearance of greater depth or volume, may present a "framed" appearance without being incorporated in a separate frame and, in some embodiments, may reduce or eliminate multiple reflections which may otherwise occur at the bevelled edges.

While the first reflective material usually comprises silver, the invention is also applicable to mirrors in which the first reflective material is other than silver, for example a metal such as aluminium, copper, chromium, gold, nickel, platinum, rhodium, nickel-chromium alloy and stainless steel or mixtures thereof.

In a first embodiment of the present invention, the bevelled edge zone is formed on the rear face of the sheet. When said one face is the rear face of the sheet, the coating of the second reflective material may then extend beyond the bevelled edge zone to the rear of the coating of the first reflective material. This may be easier to manufacture than such a mirror in which the second reflective material does not extend beyond the bevelled edge zone.

In a second embodiment of the invention, the bevelled edge zone is formed on the front face of the sheet. When said one face is the rear face of the sheet, the coating of the second reflective material is then limited, or is substantially limited to, the bevelled edge zone.

In either embodiment, we prefer that the coating of the second reflective material has a visible reflectivity less than that of the coating of the first reflective material. In this manner the difference in reflection gives the mirror a "framed" three dimensional appearance. For example, the coating of the second reflective material has a visible reflectivity of less than 75%, preferably less than 65%. The coating of the first reflective material preferably has a visible reflectivity of more than 80%, preferably more than 87%.

The bevelled edge zone may be provided, in front of the coating of the second reflective material, with a thin coating of a metal oxide, in order to generate desirable interference effects or to modify the corrosion resistance. Suitable metal oxides include those of aluminium, tin, titanium, chromium, zinc and bismuth, or silica especially SnO_2 or TiO_2, and a typical thickness for this layer is from 5 to 200 nm. Thus a glass sheet may be coated with about 110 nm SnO_2 and about 45 nm Cr to provide a golden colour. By reducing the thickness of the coating of SnO_2 to 70 nm, one may obtain a blue-violet colour.

Preferably, the second reflective material comprises a metal, such as aluminium, copper, chromium, gold, nickel, platinum, rhodium, silver, nickel-chromium alloy and stainless steel or mixtures thereof. The second reflective material may be chosen according to its reflectivity and/or according to its colour. Chromium is preferred because of its resistance to corrosion.

The bevelled edge zone preferably has an area in the plane of the sheet occupying 30% or more of the sheet. A typical mirror may have a rectangular shape with an area of for example 3500 mm^2. Clearly, mirrors of other shapes are also possible, in particular circular or oval. Typically, the bevelled edge has a width of at least 40mm, such as about 70mm. The bevel angle of the bevelled edge zone may lie between 4° and 10°.

The bevelled edge zone may extend totally around a central zone of the mirror, that is to provide the impression of a frame. The bevelled edge zone may all be coated with the same reflective material or, if desired, different parts thereof may be coated with different reflective materials, according to the desired effect.

According to a second aspect of the invention, there is provided a process for forming a decorative mirror from a sheet of transparent material having a coating of a first reflective material formed on one face thereof characterised by providing the sheet with a bevelled edge zone, and by forming a coating of a second reflective material on the inclined face of the bevelled edge zone. Looking at the process as a whole, it comprises the steps of: (i) forming a coating of a first reflective material on the rear face of a sheet of transparent material; (ii) bevelling the sheet of transparent material thereby to form a bevelled edge zone thereon; and (iii) forming a coating of a second reflective material on the inclined face of the bevelled edge zone.

Preferably, the bevelled edge zone is formed after the formation of the coating of the first reflective material on the sheet, although this is not necessarily the case.

The coating of the first reflective material is preferably formed by silvering (for example by making use of the process

described in British patent specification GB 2102453A - Glaverbel) and the coating of the second reflective material is formed by cathodic vacuum deposition, for example by making use of the process described in British patent specification GB 2 229 737, especially by deposition in an inert argon atmosphere using a chromium cathode at a pressure of about 10^{-1} Pa.

The thicknesses of the coatings of the first and second reflective material are not especially critical, since the majority of light will be reflected from the adjacent surface thereof and does not pass through the material to the further surface thereof. However, in practice, we have found that a coating thickness of between 40 nm and 150 nm is suitable.

In a preferred embodiment of the process, the bevelled edge zone is formed by grinding on the rear face of the sheet which carries the coating of the first reflective material. The bevelled edge zone may be formed by grinding techniques, such as described by G Holzmann & Ch Weisner, in Industrial Diamond Review, vol 44, 1984, pp 187 to 190. Thus, a bevel cut generally requires five operations, rough grinding, fine grinding (twice) and polishing (twice). Rough grinding is performed with metal bond cup wheels containing D126 (120/140 US mesh) diamond grit, while for the intermediate and fine grinding operations resin bond wheels containing D46 (325/400 US mesh) diamond grit are used. For superfinishing, resin bond wheels impregnated with diamond micron powder ranging from FEPA M40 to M10 size are used. Polishing is carried out with conventional softer abrasive polishing media. In some cases the second reflective coating is formed on the rough surface of the bevelled edge after grinding, to give a special aesthetic effect.

In some preferred embodiments, the bevelled edge zone is formed on the front face of said sheet and a mask is applied to a central zone of the front face of the sheet prior to the deposition of said second reflective material by cathodic vapour deposition onto the inclined face of said bevelled edge zone.

The invention will now be described in more detail, with reference to the accompanying drawings, which are not drawn to scale and in which:

Figure 1 shows a cross-section through a decorative mirror according to the invention;

Figure 2 shows a front view of the mirror shown in Figure 1; and

Figure 3 shows a cross-sectional view of an alternative embodiment of the invention.

In Figures 1 and 2, there is shown a decorative mirror (10) comprising a sheet (12) of glass having a thickness of 6 mm, and an area of 500 x 700 mm, the rear face (14) of which carries a coating (16) of silver, having a thickness of 100 nm protected by a coating (17) of copper (30 nm) and an outer coating (19) of varnish (50 µm). The mirror (10) has a bevelled edge zone (20) formed on the rear face (14) of the glass sheet (12). The inclined face of the bevelled edge zone (20) carries a coating (18) of chromium.

The mirror (10) is formed as follows. Firstly, a coating (16) of silver is formed on the rear face (14) of a glass sheet (12) by silvering in a manner well known in the art.

Thereafter, all the edges of the glass sheet (12) are bevelled by grinding in a manner well known in the art to form a bevelled edge zone (20) thereon. The operation of bevelling the sheet (12) removes the silver, copper and varnish coatings from the bevelled edge zone (20). The bevelled edge zone (20) has a width of 50mm and thus occupies about 31% of the glass sheet (12).

The bevel angle of the bevelled edge zone (20) is about 7°.

Finally, the coating (18) of chromium having a thickness of 45 nm is formed on the inclined face of the bevelled edge zone (20) by cathodic vacuum deposition, for example by the use of a magnetron. The coating (18) of chromium extends across the whole of the rear surface of the mirror, that is beyond the bevelled edge zone (20) to the rear of the coating (16) of silver, and thus serves to protect the exposed edges of the coatings of silver and copper, particularly the exposed edges of the silver coating against corrosion..

The chromium coating (18) has a visible reflectivity of between 50% and 60%, while that of the silver coating (16) is about 90%.

The central zone of the mirror thus has a normal appearance while the reduced reflectivity at the bevelled edge zone produces the effect of increased volume and provides a particularly advantageous aesthetic impression with a "framed" effect.

In the embodiment shown in Figure 3, the bevelled edge zone (20) is formed on the front face (22) of the glass sheet (12). In this embodiment the chromium coating (18) is formed on the inclined front face (22), but in this case does not extend beyond the limits of the bevelled edge zone.

In a variant of the embodiment just described, the coatings 16, 17 and 19 in Figure 1 are replaced by a single coating of chromium or by a coating of metal oxide and chromium layers.

In another variant, a single reflective layer of chromium with or without a metal oxide may be provided on the front face 22 and a bevel such as described in Figure 3 may be provided without coatings 16, 17 and 19.

In a further variant, coatings of different reflective materials may be provided on different regions of the inclined face of the bevelled edge zone 20, for example a different reflective material on each of the sides of the rectangle, thereby to obtain a non-uniform "framed" effect.

In a still further variant, the inclined face of the bevelled edge zone 20 is unpolished and a coating of chromium is deposited thereon, together with an interferential coating to provide a golden tint. By providing the reflective layer on an unpolished surface a brass appearance is created. Without the interferential coating however, the chromium coating has a dull grey appearance, similar to that of unpolished aluminium, due to the unpolished surface of the bevelled edge zone.

CLAIMS

1. A decorative mirror (10) comprising a sheet (12) of transparent material, one face (14) of which carries a coating (16) of a reflective material, the mirror (10) having a bevelled edge zone (20), characterised in that the inclined face of the bevelled edge zone (20) carries a coating (18) of a reflective material.

2. A decorative mirror according to claim 1, wherein said one face carries a coating (16) of a first reflective material and the inclined face of the bevelled edge zone carries a coating of a second, different, reflective material.

3. A decorative mirror according to claim 1 or 2, wherein said one face is the rear face (14) of said sheet.

4. A decorative mirror according to any preceding claim, wherein the bevelled edge zone (20) is formed on the rear face (14) of the sheet (12).

5. A decorative mirror according to claim 4, wherein the coating (18) carried on the inclined face of said bevelled edge zone extends beyond the bevelled edge zone (20) to the rear of the coating (16) carried on said one face (14).

6. A decorative mirror according to any one of claims 1 to 3, wherein the bevelled edge zone (20) is formed on the front face (22) of the sheet (12).

7. A decorative mirror according to any preceding claim, wherein the coating (18) carried on the inclined face of said bevelled edge zone has a visible reflectivity less than that of the coating (16) carried on said one face.

8. A decorative mirror according to claim 7, wherein the coating (18) carried on the inclined face of said bevelled edge zone has a visible reflectivity of less than 75%, preferably less than 65%, and the coating (16) carried on said one face has a visible reflectivity of more than 80%, preferably more than 87%.

9. A decorative mirror according to any preceding claim, wherein the reflective material carried on the inclined face of the bevelled edge zone comprises a metal.

10. A decorative mirror according to claim 9, wherein the reflective material carried on the inclined face of the bevelled edge zone comprises chromium.

11. A decorative mirror according to any preceding claim, wherein the reflective material carried on said one face comprises silver.

12. A decorative mirror according to any preceding claim, wherein the bevelled edge has a width of at least 40mm.

13. A decorative mirror according to any preceding claim, wherein the bevel angle of the bevelled edge zone (20) lies between 4° and 10°.

14. A process for forming a decorative mirror (10) from a sheet (12) of transparent material having a coating (16) of a first reflective material carried on one face (14) thereof characterised by providing the sheet (12) with a bevelled edge zone (20), and by forming a coating (18) of a second reflective material on the inclined face of the bevelled edge zone (20).

15. A process according to claim 14, wherein the coating (18) of the second reflective material is formed by cathodic vacuum deposition.

16. A process for forming a decorative mirror (10), characterised by the steps of:

(i) forming a coating (16) of a first reflective material on the rear face (14) of a sheet (12) of transparent material;

(ii) bevelling the sheet (12) of transparent material thereby to form a bevelled edge zone (20) thereon; and

(iii) forming a coating (18) of a second reflective material on the inclined face of the bevelled edge zone (20).

17. A process according to claim 16, wherein the bevelled edge zone (20) is formed after the formation of the coating (16) of the first reflective material on the sheet (12).

18. A process according to any one of claims 14 to 17, wherein the coating (16) of the first reflective material is formed by silvering and the coating of the second reflective material is formed by cathodic vacuum deposition.

19. A process according to any one of claims 14 to 18, wherein the bevelled edge zone (20) is formed by grinding on the rear face (14) of the sheet (12) which carries the coating (16) of the first reflective material.

20. A process according to any one of claims 14 to 19, wherein the first reflective material is silver and the second reflective material is chromium.

21. A process according to any one of claims 14 to 20, wherein the bevelled edge zone is formed on the front face of said sheet and a mask is applied to a central zone of the front face of the sheet prior to the deposition of said second reflective material by cathodic vapour deposition onto the inclined face of said bevelled edge zone.

22. A process according to any one of claim 19, wherein the coating of the second reflective material is formed on the rough surface of the bevelled edge zone after grinding.

Pat nts Act 1977
Examiner's rep rt to the Comptroller und r Secti n 17 (The S arch Report) -13-

Application number

GB 9311518.6

Relevant Technical fields

(i) UK Cl (Edition L) A4V (V26); G2J (JMX)

(ii) Int Cl (Edition 5) A45D; A47G; G02B

Search Examiner

R E HARDY

Databases (see over)

(i) UK Patent Office

(ii) WPI

Date of Search

1 JULY 1993

Documents considered relevant following a search in respect of claims ALL

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 0350329 A (TOBIN) page 2 line 68 onwards	Claim 1 at least
X	GB 0274842 A (GRAMBACH) Figure 2	Claim 1 at least
X	US 4192905 A (SCHEIBAL) Figure 3 and column 2 lines 60-63	Claim 1 at least

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present applicati n.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).